

IN THE CLAIMS

Please cancel claim 2.

Please amend claims 1, 3, 5, 6, 22, 25, and 28 as follows:

1. (Currently Amended) A no-flow underfill material comprising:

an epoxy-based resin; represented by:

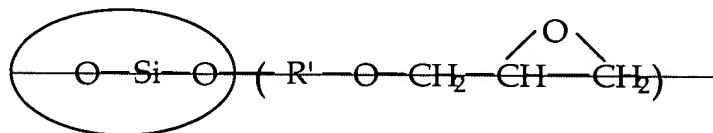


where R1 includes SiO₂:

R2 is a reactive organic functional group selected from the group consisting of an isocyanate group and a carbonyl chloride group:

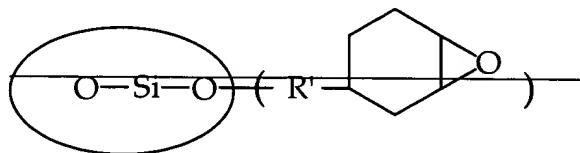
R3 is an organic chain segment;

~~including oxirane grafted silica particles; represented by~~



or

(1)



(2)_i

~~wherein R' is an organic linkage between a surface of a silica particle and a diglycidylether type oxirane group and not a reaction product of a reaction between an oxirane group and an hydroxyl group;~~

at least one agent acting as a cross-linking hardener and a curing catalyst capable of

catalyzing the curing of the epoxy-based resin; and
a fluxing agent.

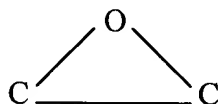
2. (Cancelled)

3. (Currently Amended) The material of claim 2 1 wherein R1 is a surface-grafted fused silica particle with a size less than 50 microns.

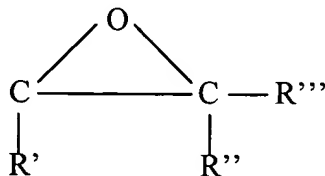
4. (Previously Presented) The material of claim 3 wherein a structure of R1 is made cyclic.

5. (Currently Amended) The material of claim 2 1 wherein R1 includes an oxygen atom linked to the silica particle, R3 being linked to the oxygen atom.

6. (Currently Amended) The material of claim 2 1 wherein R2 includes an oxirane group represented by:

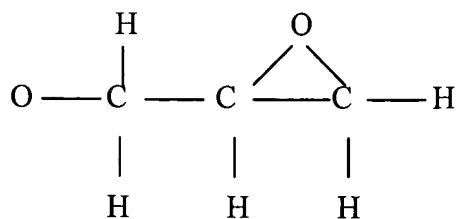


7. (Previously Presented) The material of claim 6 wherein R2 is represented by:

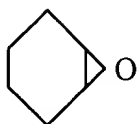


Wherein R', R'', and R''' are hydrogen or alkyl groups.

8. (Previously Presented) The material of claim 7 wherein R2 is represented by:



or



9. (Previously Presented) The material of claim 1 wherein the agent acting as a cross-linking hardener and a catalyst includes both a hardener and a catalyst.

10. (Previously Presented) The material of claim 1 wherein the cross-linking hardener is selected from the group consisting of an imidazole and its derivatives, an amine, a triphenylphosphine, an anhydride, a polyamide, a polyamide amine, a phenolic resin, and an onium salt.

11. (Previously Presented) The material of claim 1 wherein the catalyst is selected from the group consisting of an imidazole and its derivatives, an imidazolium salt, a triphenylphosphine, a tertiary amine, and an onium salt.

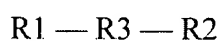
12. (Previously Presented) The material of claim 1 wherein the fluxing agent is dissolved in a mixture of the epoxy-based resin and the agent acting as a cross-linking hardener.

13. (Previously Presented) The material of claim 1 wherein the fluxing agent is selected from the group consisting of an organic carboxylic acid, a polymeric fluxing agent, and an organic compound that contains one or more hydroxyl groups.
14. (Previously Presented) The material of claim 1 further comprising:
an adhesion promoter.
15. (Previously Presented) The material of claim 14 wherein the adhesion promoter is selected from the group consisting of a silane coupling agent, an organo-ziconate, and an organo-titanate.
16. (Previously Presented) The material of claim 1 further comprising:
a non-ionic surfactant.
17. (Previously Presented) The material of claim 16 wherein the surfactant is selected from the group consisting of polyol, a siloxane compound, and a fluorinated compound.
18. (Previously Presented) The material of claim 1 further comprising:
fused silica.
19. (Previously Presented) The material of claim 1 further comprising:
silver flakes.

20. (Previously Presented) The material of claim 1 further comprising:
thermally conductive particles.

21. (Previously Presented) The material of claim 20 wherein the thermally conductive particles include a material selected from the group consisting of silicon nitride, silicon borate, alumina, diamond, and silicon oxide.

22. (Currently Amended) A no-flow underfill material comprising:
an epoxy resin; represented by:

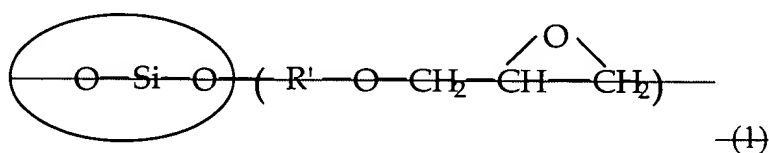


where R1 includes SiO₂:

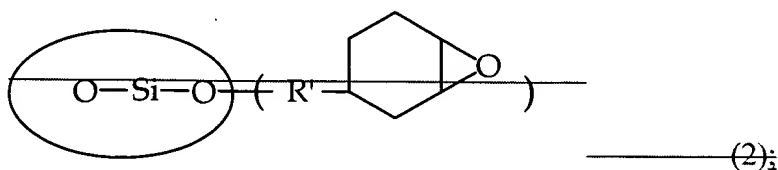
R2 is a reactive organic functional group selected from the group consisting of an isocyanate group and a carbonyl chloride group;

R3 is an organic chain segment;

~~including oxirane grafted silica particles and being represented by~~



or



~~wherein R' is an organic linkage between a surface of a silica particle and a diglycidylether type oxirane group and not a reaction product of a reaction between an oxirane group and an hydroxyl~~

group;

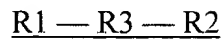
at least one agent acting as a cross-linking hardener and a curing catalyst capable of catalyzing the curing of the epoxy resin; and
a fluxing agent.

23. (Previously Presented) The no-flow underfill material of claim 22 further comprising:
an adhesion promoter;
a non-ionic surfactant;
fused silica;
silver flakes; and
thermally conductive particles.

24. (Previously Presented) The no-flow underfill material of claim 22 wherein the agent acting as a cross-linking hardener and a catalyst includes both a hardener and a catalyst.

25. (Currently Amended) A semiconductor package comprising:
a package substrate;
bond pads on the substrate;
a semiconductor die;
contact pads on the semiconductor die;
a respective conductive bump on each contact pad, the die being located so that each bump is in contact and attached to a respective bond pad; and
an underfill material filling regions between the bumps and including at least an epoxy-

based resin; represented by:

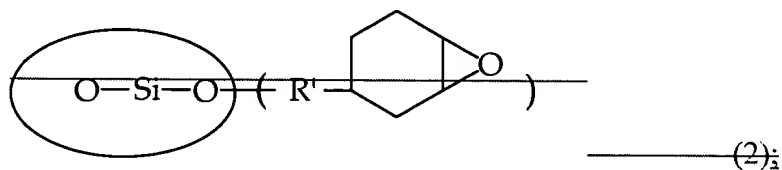
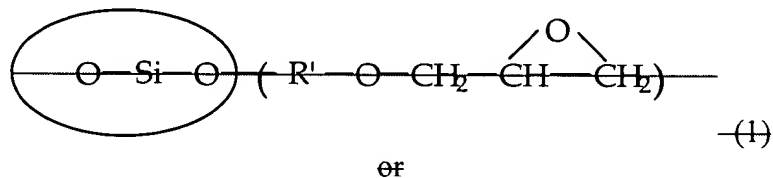


where R1 includes SiO₂.

R2 is a reactive organic functional group selected from the group consisting of an isocyanate group and a carbonyl chloride group;

R3 is an organic chain segment;

~~including oxirane grafted silica particles and being represented by~~



~~wherein R' is an organic linkage between a surface of a silica particle and a diglycidylether type oxirane group and not a reaction product of a reaction between an oxirane group and an hydroxyl group;~~

at least one agent acting as a cross-linking hardener and a curing catalyst capable of catalyzing the curing of the epoxy resin; and
a fluxing agent.

26. (Canceled)

27. (Cancelled)

28. (Currently Amended) A semiconductor package comprising:

- a package substrate;
- bond pads on the substrate;
- a semiconductor die;
- contact pads on the semiconductor die;
- a respective conductive bump on each contact pad, the die being located so that each bump is in contact and attached to a respective bond pad; and
- an underfill material filling regions between the bumps and including at least an epoxy-based resin; represented by:

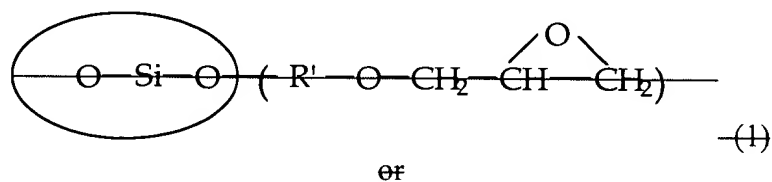


where R1 includes SiO₂;

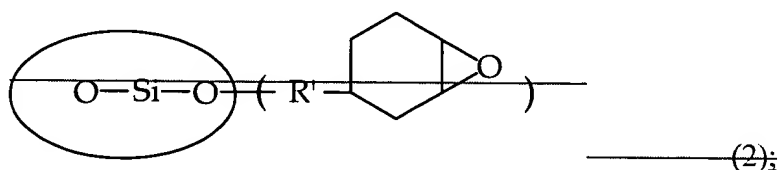
R2 is a reactive organic functional group selected from the group consisting of an isocyanate group and a carbonyl chloride group;

R3 is an organic chain segment;

~~including oxirane grafted silica particles and being represented by~~



or



~~wherein R' is an organic linkage between a surface of a silica particle and a diglycidyle ether type~~

~~oxirane group and not a reaction product of a reaction between an oxirane group and an hydroxyl group.~~

at least one agent acting as a cross-linking hardener and a curing catalyst capable of catalyzing the curing of the epoxy resin; and
a fluxing agent.

29. (Previously Presented) The material of claim 1, wherein R' is selected from the group consisting of a urethane group and a carboxyl group.

30. (Previously Presented) The no-flow material of claim 22, wherein R' is selected from the group consisting of the urethane group and the carboxyl group.

31. (Previously Presented) The semiconductor package of claim 25, wherein R' is selected from the group consisting of the urethane group and the carboxyl group.